

## 121 AIRFIELD FUEL DISPENSING

### 121 10 AIRCRAFT DIRECT FUELING STATION (GM)

Description. Aircraft direct fueling stations provide outlets where aircraft can be fueled from a closed circuit fuel system as opposed to refueler trucks.

Policy. Refueler trucks are the preferred method to fuel aircraft. However, direct fueling stations may be considered for: (1) carrier aircraft, including helicopters, when the mission dictates a continuing need for rapid turnaround without shutting engines down, (2) cargo/transport aircraft with prescribed short ground times or (3) patrol aircraft which require an average refueling of 2500 gallons or more. Aircraft direct fueling stations shall be installed only when authorized by NAVFACENGCOM HQ and NAVALRSYSCOM HQ. NAVFACENGCOM HQ (Code 04) and NAVAIRSYSCOM HQ (Code 4106) will provide technical assistance for the determination of the type and number of fueling station.

Criteria. Aircraft direct systems utilize multi-arm pantographs with closed circuit type nozzle assemblies. Cargo/transport aircraft may also be refueled from flush type direct fueling stations located in the apron in conjunction with hose/pantograph trailers or trucks. However, flush fueling stations should only be used where taxi patterns preclude the parking of aircraft in spaces which can be reached by apron edge fueling stations with fully extended (135 foot maximum reach) five arm pantographs.

The number of fueling outlets required must be determined by an engineering analysis. Where aircraft require quick turnaround, (i.e., transport aircraft with minimum ground time, tactical aircraft returning to the dir without shutting down engines, or patrol aircraft on ready alert status), the number of fueling outlets required is a function of the number of aircraft that must be refueled within the specified time frame. NAVFAC Design Manual (DM-22) provides guidance on the minimum number of outlets, fuel flow per outlet and total fuel flow required in the system. Systems are designed such that the flow in the system is less than the sum of the maximum outlet capacities. Three or four outlets each capable of delivering 600 gallons per minute (GPM) can be adequately served by a system with a capacity of 1200 GYM.

When determining the number of outlets required for simultaneous refueling of aircraft, the average rate at which the aircraft can receive fuel shall be used rather than the maximum GPM capacity of the outlet. For example, if the average fuel receiving rate for an aircraft is 250 GPM (the actual rate varies during filling), and the aircraft normally requires 2000 gallons of fuel, the fill up time equals  $2000/250$  or 8 minutes. Allowing 7 minutes for other functions such as brake check, taxiing, hook-up, paper work etc., one aircraft can refuel every 15 minutes. In this case each outlet could fuel 4 aircraft per hour. If the mission requirement is to turnaround 8 aircraft per hour, two outlets would be required. NAVFAC DM-22 specified a minimum of 2 outlets per fueling system.

Siting Requirements. The location of fueling stations at an activity depends on the aircraft mission and configuration of runways, taxiways and aprons. The fueling stations may be located adjacent to through taxiways, parking aprons or dedicated fueling taxiways. See NAVFAC P-272, Drawing 1403986, for the layout of a fueling station with dedicated taxiways. Where direct fueling is used to hot fuel tactical aircraft, fueling stations shall be located to allow quick return to the a runway. For cargo/transport aircraft, the fueling stations shall normally be located adjacent to where the aircraft are loaded/unloaded so that fueling may be done simultaneously with other logistic operations. Patrol aircraft may be fueled at their parking spaces or at some point enroute to the runway.

Direct fueling stations shall be sited outside the runway or helipad primary surface and such that fueling equipment and the aircraft to be refueled do not penetrate the transitional surface as defined in NAVFAC P-80.3. Direct fueling stations shall not be sited beneath the approach-departure clearance surface. Fueling stations with dedicated access taxiways shall be located a minimum 100 feet from the edge of a parking apron and 150 feet from the centerline of a through taxiway. The size and spacing of fueling lanes shall be in accordance with NAVFAC P-272, Definitive Drawing 1403986. Normally, when fueling stations are proposed adjacent to parking aprons or through taxiways, an airfield safety waiver from NAVAIRSYSCOM would be required prior to construction. However, in this case no formal waiver is required provided NAVPACENGCOM and NAVAIRSYSCOM have approved overall-planning for the project. Aircraft direct fueling stations shall not be sited within 200 feet of an inhabited building. Siting of fuel dispensing facilities must consider the effects of electromagnetic radiation, see NAVFAC DM-22 for guidelines.

## **121 20 AIRCRAFT TRUCK FUELING FACILITY (GM)**

Description. An aircraft truck fueling facility is used to transfer fuel to aircraft refueler trucks. The fueling equipment is located on concrete islands which are designed to provide fuel from one side only. Where more than one island (one fueling outlet per island) is required, they shall be arranged parallel to each other with 15 feet between adjacent sides. The pavement between islands is sloped to a drain or catch basin which is connected to d containment area in case of a fuel spill. See NAVFAC P-272, Drawing 14039987 for a sketch of a typical refueler truck fill stand and NAVFAC DM-22 for design criteria.

Policy. The use of refueler trucks is the preferred method to fuel aircraft. However, see category code 121-10 to determine when a direct fueling system may be considered. When direct fueling is provided, it always is in conjunction with truck fueling. An aircraft truck fueling facility supplied from a spur of the direct fueling system usually reduces non-productive truck time and is less costly than a separate truck fueling facility because the filter/separator and fuel monitor would be omitted. Also, depending upon the spurs' location in the system, a relaxation chamber may not be required. See NAVFAC definitive drawing 1403985 and NAVFAC design Manual DM-22, Chapter 3, Section 4. The determination of number of grades of fuel to be handled and the number of outlets required for each grade shall be made in conjunction with NAVPACENGCOM HQ (Code 04) and NAVAIRSYSCOM HQ (Code 4106).

Criteria. The number of outlets required must be determined by an engineering analysis. The maximum capacity of each outlet is 600 gallons per minute (GPM) Factors to be considered in the engineering analysis include:

- (a) The number of grades of fuel to be provided. Each grade requires a separate outlet.
- (b) The number of aircraft that must be refueled during peak periods of recovery and launch.
- (c) The rate at which the fueling facility can fill refueler trucks. Refueler trucks can accept up to 600 GPM, however, a figure of 450 gpm is more typical of rates achieved. Standard Navy refueler trucks can hold 5000 gallons of fuel. The capacity of refueler trucks in contract refueling operations vary and 8000 gallons is not uncommon.
- (d) The rate refueler trucks can fuel aircraft. While refueler trucks can dispense fuel at approximately 250 GPM, only the larger and more modern jet aircraft can accept fuel at that rate and then only during the initial refueling phase. For planning purposes, the average aircraft fueling rates should be 200 GPM for large jet aircraft (Patrol/transport), 150 gpm for tactical jet aircraft and 100 GPM or less for rotary wing jets and all reciprocating engine aircraft using aviation gasoline (AVGAS). Some larger aircraft can simultaneously take on fuel from two trucks in which case a combined average flow of 400 GPM can be use.
- (e) The distance the refueler trucks have to transit between the fueling stand and the aircraft. The distance should be minimized to reduce transit times.

The analysis should consider that aircraft can be refueled overnight for morning departures. Peak demand for the truck fueling facility will normally occur at mid-morning or mid-afternoon when high rates of aircraft recovery are experienced.

Siting. Aircraft truck fueling facilities shall not be sited within the primary surface or under the approach/departure clearance surface of any runway or helipad. The facilities shall be sited so that no part of the fueling stand, equipment or refueler truck penetrates the imaginary surfaces specified in NAVFAC P-80.3 or the airfield safety clearances published in NAVFAC P-80 (see criteria for runways, helipads, taxiways and aprons). The fueling facility shall be at least 100 feet from any building, public road or above ground fuel storage tank. See NAVFAC DM-22 for additional siting restrictions with respect to electromagnetic radiation.

## **121 30 AIRCRAFT DEFUELING FACILITY (GM)**

This category code shall be used for inventory of existing facilities only. Aircraft shall be defueled into tank trucks designated for that purpose.